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DESIGN OBJECTIVES
ADVANCED LIGHT TABLE PROTOTYPE

1. INTRODUCTION:

These development objectives describe the requirements to be met in designing and fabricating an Advanced Light Table Prototype: the pre-production model of an advanced 9 1/2 X 18 inch format photo interpretation light table. The table to be designed will incorporate the best design features of the [redacted] Model 603 light table and the [redacted] Model 787-1 light table, engineering prototypes developed under previous contracts. The prototypes of these earlier tables will be available for inspection by the Contractor. Copies of the engineering drawings and specifications will be provided to the Contractor for analysis and quotation.

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2. CONCEPT:

The Advanced Light Table will provide increased operator comfort, increased illumination, easy loading, and a superior film transport system. It is to be as light-weight, compact, and simple in mechanical design as is possible within the parameters imposed by the specific requirements stated in these objectives.

3. GENERAL DESCRIPTION:

The table will generally employ the design of the [redacted] table Model 603's basic film transport system and tilting system, and the [redacted] table Model 787-1's basic illumination system or equivalent. The new table will, however, be much lighter in weight, slightly smaller in overall size, less complex, quieter, and less expensive than either the Model 603 or 787-1.

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4. REQUIREMENTS:

4.1. Illumination System - This table shall provide a 9 1/2" X 18" illuminated area for use in viewing single rolls of film between 70mm and 9 1/2" in width. The table shall use an illumination system similar in controllability, color, and light uniformity to the type found on the [redacted] Model 787-1 table (see drawings for detailed description).

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4.1.1. The illumination system must provide at least 2000 foot lamberts at maximum intensity (measured at the illumination surface) with 2500 foot lamberts a design goal. The illumination shall not vary by more than 10% between any two points within the entire illuminated surface area. The illumination intensity

shall be continuously variable throughout a range of from 10% to 100% of full intensity without evidence of "flicker."

4.1.2. The illumination system shall maintain at least 90% of its original brightness values for the first 2000 hours of operation and at least 75% for the next 2000 hours.

4.1.3. A diffuser such as a 1/8" [redacted] Lucite 2447 or equivalent diffuser shall be located between the glass top and the light source. STAT

4.1.4. An adjustable shade must be provided to block out all of the illuminated surface not actually covered by the film. The shade must be located beneath the surface glass, mounted along the long dimension of the unit and extendable across the short dimension toward the side with the fixed film spool holders. The shade must have the capability of being extended, retracted, and locked in any position from 0" to 7" from the side of the illuminating surface at which the shade is mounted. The shade must not encroach upon the illuminated viewing area when the shade is fully retracted. The shade must travel between the top glass plate and the diffuser.

4.2. Film Transport - The film transport system of the Advanced Light Table shall incorporate many of the features found on the [redacted] STAT Model 603 light table. The main points of departure from the [redacted] STAT design will be that the advanced light table is to hold only one roll of film at a time and is to have two modes of operation: either full power drive or a direct ratio manual drive--at the operator's option. The transport system shall be bi-directional and allow for the control of the film movement in either direction by any one of the handwheels or by the power drive control knob. High reliability is mandatory.

4.2.1. The film transport system must be able to accommodate single rolls of film betwen 70mm, and 9 1/2" in width on either partially or fully loaded reels of up to 500-foot capacity. The film spools will be mounted at the ends of the table, parallel with the short axis of the table. The film shall be transported from one spool to the other in either direction over the lighted surface and parallel to the long axis of the table. Rollers must be positioned in such a way as to allow the film to be transported either emulsion up or emulsion down without scratching the film surfaces. The rollers must have a hard, smooth, non-corrosive surface. No adjustable tension rollers (such as found on the earlier prototypes) will be required.

4.2.2. The manual film drive shall allow for any one of three handwheels to be used to drive the film in either direction, i.e., when the operator faces the long axis of the table and turns either the left or right-hand handwheel clockwise, the film shall move from left to right. When the operator turns either handwheel counter-clockwise, the film shall move from right to left. When the operator faces the short axis of the table with the table tilted toward him and uses the handwheel on his left, the film will move toward him when he turns the handwheel clockwise, and away from him when he turns it counter-clockwise. The manual drive shall have an approximate 1:1 ratio between the handwheels and the spools, i.e., one revolution of the handwheel will result in one revolution of the spool. The drive system shall provide very smooth winding and unwinding of film from either spool. The drive must be a low friction system incorporating both inertia damping and anti-backlash control.

4.2.3. The full power film transport system is to be used mainly for rewinding film at high speed and for constant, relatively low speed scanning. The system therefore, requires an electric drive capable of rewinding a full 500-foot spool of 9 1/2" wide film in less time than it would take an operator to rewind it manually, i.e., in less than two minutes. If necessary, the power drive system may have two speed ranges with a high/low speed range selection switch. The system shall have a single speed control knob (in addition to the optional range switch) which will permit continuous variation of the speed in either direction from 0 to 250-feet per minute (if the optional switch is used, the low range should be from 0 to approximately 100 feet per minute and the high range from 0 to 250 feet per minute, but with less sensitivity in the high range than in the low). The power drive control in the low speed range must permit the same degree of control sensitivity as the manual system. The control knob must have a definite detent for the null position between speed control ranges of the two directions of motion. Again, the system must be a low friction system incorporating inertia damping and anti-backlash control.

4.2.4. Both the manual and the full power drive systems must be able to maintain enough tension on the film at all film speeds and conditions of acceleration and deceleration of the film to prevent slack loops of film from forming.

4.2.5. Reversing mechanisms shall be included to allow the direction of rotation of the spools to be either in the same or opposite direction from the rotation of the handwheels or power control knob. This is to allow for film transport control to remain the same regardless of whether the film is viewed emulsion up or emulsion down.

4.3. Film Spool Loading and Holding Mechanism - Each film spool shall be held in place by a pair of brackets (one fixed and one movable) with a positive, quick-release spindle on one bracket and a non-sliding spindle on the other. The quick-release spindle shall be the same as or equivalent to that found on the [redacted] Model 603 light table. The fixed brackets shall be on the side of the table which the operator will normally face when he is adjacent to the long axis of the table. If films narrower than 9 1/2" are used, the operator prefers the film to be on the side of the viewing area closest to him and the unused viewing area to be shaded; therefore, the fixed brackets must be on the side of the table closest to the operator, and the shade must come toward him from the opposite side of the table. The movable bracket is to allow for varying width of spools, but it must be possible to lock this bracket in position before the spool is loaded. The spool holding mechanism must firmly support a full, 500-foot spool of 9 1/2" film (or any of the other narrower width films, or any other smaller capacity spool) at any table position in any operation, no matter what the tilt of the table or what the film-transport speed. Index marks must be appropriately placed on the table to reference the bracket positions for 70mm, 5", 6.5", and 9.5" wide film spools.

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4.4. Tilt Mechanism - The [redacted] Model 603 has an acceptable design for tilting the table, except for the noise created when activating the tilting mechanism. It is suggested that a variation of the general design used in the Model 603 be used in the Advanced Prototype. In any case the following specifications must be met.

4.4.1. Amount and Direction of Tilt. The tilt mechanism must permit the table to tilt from the horizontal to a position of 15°, measured from the vertical when rotated about the short axis, i.e., 75° above the horizontal. This tilt, because of the 9" overall height requirement (when in horizontal mode), may require a movable pivot point and assumes that the base is located at the edge of the table to permit the film spools and transport mechanism to extend out into space and clear the supporting surface. In addition, tilt about the long axis of the table must be equivalent to that stated for the short axis. These motions must be smooth, positive, and continuously variable. Ball joints, while providing the required flexibility of motion, have not proved successful in the past.

4.4.2. Tilt Lock Mechanism. A positive mechanism must be provided to lock the light table in all possible tilted and horizontal positions. This lock must be activated and

deactivated with only a minimum of force and it must retain its positive locking characteristics under continuous hard usage.

4.4.3. Electrical Wiring. All electrical wiring between the base and the light table must be carried internally or positioned where it cannot be twisted or broken off. This wiring shall not interfere in any manner with the tilting motion of the table.

4.4.4. Balance. The table must be completely stable and remain properly balanced throughout all the possible tilt positions, even with a 500 foot roll of 9 1/2" film on one end and an empty spool on the other.

4.5. General Requirements

4.5.1. The Advanced Light Table Prototype shall meet the highest commerical standards of construction. It must provide a high degree of reliability, i.e., before acceptance, the table will be required to operate under real or simulated conditions for 500 hours (not necessarily continuous) without a failure. Cover plates or access panels or other simple means of reaching the internal portions of the table must be provided for maintaining and repairing the table.

4.5.2. The table must be safety engineered. The unit must be grounded and be free of all shock hazard. All gears and other moving parts, with the exception of the film spool, film, film spool spindles, and controls, must have sufficient shielding to prevent possible accidents. The manual handwheels used for film transport must have interlocks (such as are found on the [redacted] Model 603) to prevent their turning during powered drive. STAT

4.5.3. The light table must be able to be operated continuously at maximum light intensity or at any lower intensity and in any transport mode or series of modes over a 24-hour period in a room with an 80°F ambient temperature, without exceeding 100°F temperature on any external surface.

4.5.4. The noise generated by the table shall not cause annoyance to either the operator or other workers in the area. The table shall be virtually free of high frequency hum. When neither the film transport nor the table

tilting mechanism is in operation, but when the light is on and any film tensioning device is on, the noise generated by the table must not be detectable to a broad band sound level meter above the ambient noise level at a distance of two feet from the top-front of the table (the average ambient noise level in a typical work area is 63db measured on the C weighted scale, 51db measured on the B weighted scale, and 45db measured on the A weighted scale of a [redacted] Type 1565-A Sound Level Meter). Under no circumstances will the noise level of the table measured at a distance of 5' from the table exceed 5db above ambient on the C weighted scale nor 20db above ambient on the A weighted scale of a sound level meter such as the General Radio Company Type 1565-A. STAT

4.5.5. The overall size of the unit shall not exceed 32" in length, 16" in width, and 9" in height when the table is horizontal.

4.5.6. The weight of the table must be considerably reduced from that of the earlier prototypes. A design goal is 60 pounds for the total weight of the unit. These tables are frequently moved, so overall size and weight shall be such that one man can reasonably move the table unassisted.

4.5.7. The main controls of the table shall be placed on the long side of table which the operator shall face when transporting film from right to left or left to right. A power switch must be placed in or near the center of the referenced side, with a power-on warning light above it. This power switch must be easily differentiated from all other switches on the table. The full power transport knob must be on the left of the power switch so that it may easily be reached by the operator regardless of whether he faces the long or short axis of the table or whether the table is tilted or not. The knob must be large enough (possibly 3 inches in diameter) so that it can be easily found by touch and gripped. If the speed-range selection switch is used, it must be adjacent to the speed control knob. The manual film drive handwheels must be positioned in or about the same relative positions as they are on the Model 603 table. The Model 603's handwheels are acceptable, but they could be further improved by using a slightly larger knob (one that could be gripped in the palm of the hand). It is suggested that the illumination intensity knob and shade positioning control be to the right of the power switch. It is also suggested that reversing controls (to change rotation direction of the spools when film is unwound from the top of the

spool instead of from the bottom) be located on the fixed brackets. The tilt control (either crank or rachet if manual control, or switch if electrical control) shall be located on the base. If a positive tensioning system or an electrical drag or braking system is used in the film transport system, a switch must be provided to cut the power to that system and allow for easy loading and threading of the film. It is suggested that this switch also be placed to the right of the power switch. All controls must be appropriately labeled.

4.5.8. The Advanced Light Table Prototype shall be capable of operating in all modes of operation on 117v + 10v - 15v, 60 cycle AC. The light table shall have proper fusing to prevent overload.

4.5.9. During the period of performance of the contract, the contractor will be required to submit reports to the Government as stated in specification DB-1001. At the point in time when the designs are finalized, a briefing board must be prepared in accordance with specification DB-1002 to show the external configuration of the table. In addition to the briefing board, an updated estimate must be given of the cost per table of a production run in quantities of 25, 50, 75 and 100. At the end of the contract, three operator's manuals and maintenance manuals must be delivered along with the prototype. These manuals must be prepared in accordance with DB-1003. Two complete sets of reproducible engineering drawings will also be required at the end of the contract. Final Acceptance will be made at the Sponsor's facility.

5. PROPOSAL:

Companies interested in bidding on this contract must submit proposals according to the covering letter. The proposal must include an artist's concept (8 1/2" X 11" sketch) of the prototype, a description of the technical approach the company plans to use in accomplishing the tasks, weight and size estimates, cost estimates for the prototype and for production units (in quantities of 25, 50, 75, and 100), time estimates for producing the prototype and for producing production units, and design options with accompanying cost estimates. Also included in the proposal must be a list of anticipated problems in fabricating the prototype and in manufacturing production units. If the bidder does not believe he can meet any part of the specifications, he must state his exceptions in his proposal. If the bidder believes that certain portions of the specifications are too stringent or that the cost to meet these would be excessive, the bidder must bid on the specifications as stated, then point out which portions he believes are too stringent, propose as an option what he believes to be a more reasonable approach, and explain his reasons.